

III. DESCRIPTION OF THE AURORA TROUT (*SALVELINUS TIMAGAMIENSIS*) A NEW SPECIES FROM ONTARIO.

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(PLATES VIII-IX.)

We have recently returned from the Timagami region of Ontario with specimens of a species of charr belonging to the *S. alpinus*-group, which upon examination and comparison appears to be new. The species is locally known as "Rainbow Trout," "Land-locked Salmon," and "Salmon-trout." Since none of the local names are truly applicable, we suggest that this beautifully colored trout be known as the *Aurora Trout*. It may be described as follows:

***Salvelinus timagamiensis* sp. nov.** (Aurora Trout).

Type: 7969 Carnegie Museum Catalog of Fishes, 10.75 inches in total length. *Paratypes*: 7970a-k, Car. Mus. Cat. of Fishes, ten specimens from 8.63 to 13.5 inches in total length; and one, head only, of a specimen 16.0 inches in total length.

DESCRIPTION.

Head 4.04 to 4.33 (average, 4.20) in length to end of the lateral line, or the base of the middle caudal rays. Snout 3.1 to 3.6 in head. Eye in head, 5.2 (in specimen 10. inches in total length) to 7.33 (in specimen 16 inches in total length). Vomerine teeth in a triangular patch similar to that figured for *S. perisii* by Regan (Ann. Mag. Nat. Hist., (8) XIII, p. 408), relatively strong, recurved, paired, and not extending down the shaft of the vomer. Shaft of vomer depressed, with no evidence of a raised crest. This condition is typical of the genus *Salvelinus*. No evidence of basibranchial teeth in any of the specimens examined; teeth of the tongue and dentary strong and recurved. Pyloric cœca elongate and tubular rather than lobate, quite similar to those of *S. fontinalis*, and numbering thirty-five in the single individual examined (7970j). Branchiostegals and gill-rakers variable, as indicated in the appended table of measurements.

D., 10; A., 9; P., 13-14; V., 8-9. Scales 47 to 50 about 240 to 250—41 to 44; scales from adipose fin to lateral line, 27; scales with pores about 130 to 137. Lower jaw (distance from tip to junction with the quadrate) in head, 1.43 to 1.60 (av., 1.50). Upper jaw (distance from tip of snout to end of maxillary) in head, 1.57 to 1.72 (av., 1.65).

Maxillary extremely elongate. In large specimens (13.5 and 16 inches in total length) the maxillary extends beyond the vertical from the posterior margin of the eye a distance equal to the total length of the orbit, as measured from the anterior tip of the triangular orbital membrane to the posterior edge of the eyeball. In a specimen of *S. namaycush* of about the same size (U. S. N. M., 77,866) the maxillary extends beyond the posterior margin of the eye a distance equal to about only three-fourths of the length of the eyeball. In smaller specimens of the present species (8.5 to 10 inches in total length) the maxillary extends beyond the vertical from the posterior margin of the eye a distance about equal to, or slightly less than, the length of the eyeball. This proportion is similar in specimens of *S. fontinalis* of the same size.



FIG. 1. Outline of head of *S. timagamiensis*, C. M. No. 7970k, 16 in. long. One-half natural size.

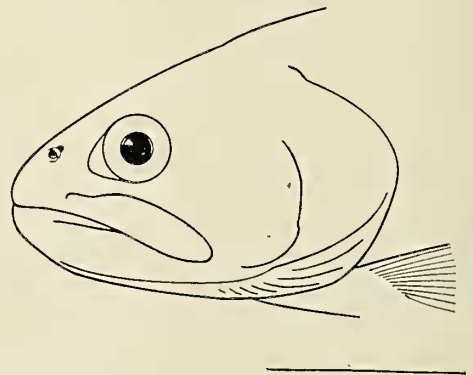


FIG. 2. Outline of head of *S. timagamiensis*, C. M. No. 7970b, 8.75 in. long. Three-fourths natural size.

Distance from tip of snout to end of maxillary in smaller specimens about equal to the length of the pectoral fin and to the length of the longest caudal rays. In the larger specimens this distance is greater than the pectoral length. In species with a short maxillary, such as *S. oquassa*, this distance is much less than the pectoral length.

Body robust; profile arched; and head relatively broad and flattened or depressed. Depth at origin of the dorsal, 1.04 to 1.18 (av., 1.11) in length of head; and this depth 4.44 to 4.90 (av., 4.65) in length to base of caudal.

Dorsal with ten rays; distance from tip of snout to origin of dorsal about equal the distance from the posterior base of the dorsal to the base of the middle caudal rays. The origin of the dorsal is about 0.8 of the diameter of the eye anterior to the midline between the snout and the base of the caudal. Dorsal higher than its base is long; its base 1.1 to 1.3 (av., 1.23) in the length of its longest (the second) ray, and 2. to 2.45 (av., 2.2) in head. Length of longest ray of the dorsal 1.5 to 1.95 (av., 1.78) in head. The distance from the posterior end of the base of the dorsal to the origin of the adipose fin is about equal to the length of the head. The distance from the tip of the snout to the base of the pectoral, 0.96 to 1.25 (av., 1.11) in the distance from the dorsal to the adipose and 1.9 to 2.43 (av., 2.11) in the distance from the tip of snout to the origin of the dorsal.

Pectoral 13-14; the pectoral is the longest of the fins, its length being about equal to that of the longest caudal rays and 1.4 to 1.76 (av., 1.59) in head. The distance from the base of the pectoral to the base of the ventral is 3.01 to 3.42 (av., 3.28) in the length to the base of the caudal.

Ventral with 8-9 rays. The ventral is situated slightly anterior to the median line from the base of the dorsal; its origin being very slightly nearer the tip of the snout than to the base of the middle caudal rays. The distance from the base of the ventral to the origin of the anal is slightly less than the length of the head, being about equal to the length of the head, less half of the total orbital diameter, and is contained from 4.48 to 5.10 (av., 4.71) in the length to the base of the caudal.

Anal with 9 rays. The height of the anal fin (measured from in front of the anterior base, or origin, to the tip of the third, and longest, ray) equals 0.6 to 0.77 (av., 0.67) of the distance from the ventral to the anal. The length of the anal base equals 0.58 to 0.69 (av., 0.64) of the height of the anal. The height of the anal in the younger specimens is greater than the distance from the posterior base of the anal to the lower base of the caudal, and in the larger specimens it is about equal to this distance. The anal fin is of about the same length as the pectoral fin, or slightly less. The distance

from the posterior base of the anal to the lower base of the caudal (this measurement cannot be accurately taken) is slightly greater than the distance from the posterior base of the adipose to the upper base of the caudal, containing the least depth of the caudal peduncle from 1. to 1.63 (av., 1.28) times. The caudal in specimens of all sizes is slightly lunate or truncate, being very similar to that of *S. fontinalis*. It is never notched, or forked.

The coloration we record is based upon notes made in the field from freshly captured specimens.

A small specimen, sex indeterminate, about nine inches in length, has the dorsal surface uniformly iridescent dark olive-green¹ which has a golden glint in the sunlight. The sides become paler, below the lateral line becoming silvery, and gradually shading into the pure white abdomen. Alcoholic specimens, when revolved in the light, give off a steel-blue iridescence, indicating that this coloration is structural rather than pigmentary. Coloration uniform, *i. e.*, without spots, only one small specimen (7970c) showing faint traces of a darker dorsal mottling. Iris oval and black; margin of iris greenish golden. Belly pure white. Fins colored as in the adult, except that their inner border is white, instead of light lemon-yellow.

A sexually mature female (7970j C. M. Cat. Fishes) 13.5 inches in total length has the dorsal coloration similar to younger specimens, but darker; the plumbeous color being uniform, progressively lighter ventrally. Dorsal and caudal fins uniformly bluish or colorless. In some cases black pigment overlies the fin-rays of the dorsal; never, however, producing black spots, as in *S. fontinalis*. Pectorals, ventrals, anal, and lower lobe of caudal margined with clear white, then a solid ivory-black patch which tapers terminally to form a narrow black streak, which follows the white outer margin to its tip. Balance of all fins (except dorsal and caudal) bright crimson-madder, except inner third, which fades to a very pale lemon-yellow. Lower jaw and abdomen pure white; throat and branchiostegals outlined with dusky.

Lateral spots, characteristic of most species of trout, are lacking in all of our specimens, except C. M. Cat. Fishes No. 7970j. On the left side, just below the lateral line this specimen has two spots, the

¹ Although our field-notes indicate that the dorsal region is colored dark olive-green, no trace of this coloration is evident in the alcoholic specimens, which cause it to appear that the coloration of this region is dark bluish-silvery, or plum-colored

anterior just above the tip of the pectorals, and the posterior anterior to the vertical from the ventrals. These spots are quite similar to the typical ocelli of *S. fontinalis*, consisting of a central spot of crimson-madder surrounded by a very light blue aureola. It is our belief, based on observations made by the junior author in September, 1923, that, as the colder weather and, presumably, the breeding season approach, faint indications of the presence of the bicolored (red and blue) ocelli appear, and can be detected on very close examination. After several months of preservation in alcohol, several of our specimens show faint, irregular, colorless blotches that are in no wise similar to the sharply defined, yellow spots of *S. fontinalis* preserved under exactly similar conditions. There was, however, no indication of these colorless areas at the time of capture.



1



2

FIG. 3. Alcoholic specimens of
1. *S. timagamiensis*, C. M. No. 7970j,
2. *S. fontinalis*, C. M. No. 7977a.

DIFFERENTIATION.

Although a member of the arctic or alpine charrs, (*S. alpinus*-group of Regan), having the clear, or unmottled fins, and the dentition of that group, this species has many resemblances to the Brook-trout (*S. fontinalis*), especially in the size and shape of the maxillary and in the truncate caudal fin. As pointed out in the description of the coloration, this similarity is enhanced by the presence in one specimen (7970j) of two of the typical crimson spots of *S. fontinalis*.

However, it differs markedly from this species in coloration, being a more or less uniformly colored, bluish-silvery fish. The presence in the same waters of specimens of the true *S. fontinalis* proves that *S. timagamiensis* is not a lacustrine, nor a color-variety of *S. fontinalis*.

The Canadian Red Trout, *S. marstoni* (Garman), the geographic range of which approaches most nearly that of the present species, is the only form of the "*S. alpinus*-group" which is not extremely restricted in its habitat. It has been recorded from a number of lakes in Quebec between Lac de Marbre or Marble Lake in Wakefield township, Ottawa County, north of the Ottawa River, down along the St. Lawrence River to Rimouski County on the south shore. A full list of localities for this species is given by Evermann and Goldsborough (Proc. Biol. Soc. Wash., XX, 1907, p. 104). *S. marstoni* is not at all closely allied to *S. timagamiensis*, since it has a relatively short maxillary, sharp recurved teeth on the tongue, which are quite feeble in *S. timagamiensis*, and a deeply cleft or forked tail. As emphasized in the original description by Garman (Science, XXII, 1893, p. 23) in *S. marstoni*, "the caudal notch is deeper... than in any other of the American forms, except *S. namaycush*." The dorsal and anal fins are also longer, each having thirteen rays. Differences in color would doubtless also be evident in living specimens. Color-plates of both sexes of *S. marstoni* from drawings by Denton were published in the "Fifth Annual Report of the Commissioners of Fisheries, Game, and Forests of the State of New York" for 1899 (1900), under the caption, "The Canadian Red Trout." In the same series for the following year (Sixth Ann. Rept., 1900 (1901), pp. 353-356), Mr. John W. Titcomb gave an interesting treatise on the life-history and habits of this trout. For purpose of direct comparison we have received a specimen of *S. marstoni*, determined by Mr. Samuel Garman, from the Museum of Comparative Zoölogy and another from the U. S. National Museum (No. 72,292) from the Laurentides National Park (Lake St. John District) of Quebec.

From the Silver Trout of Monadnock Lake (*S. agassizii* Garman) *S. timagamiensis* differs considerably. In *S. timagamiensis* the maxillary is much longer and, as in *S. fontinalis*, the form is essentially depressed; while *S. agassizii* is a much slenderer fish, with a pointed snout and slightly notched caudal, contrasting with the blunt snout and truncate caudal of *S. timagamiensis* and *S. fontinalis*.

From the Blue-back Trout of the Rangeley Lakes (*S. oquassa*), *S. timagamiensis* is differentiated in several important structural details. In addition to having a longer maxillary *S. timagamiensis* has the ventral fins more anterior; the distance from the tip of the snout to the base of the ventral fins being less than that from this point to the base of the caudal. In *S. oquassa* these distances are approximately equal. The fact that *S. timagamiensis* possesses this extremely elongate maxillary serves to differentiate it immediately from all other species of *Salvelinus* of northeastern North America such as *S. alpinus*, *S. alipes*, and *S. aureolus*, without a further consideration of structural and color-differences, which are numerous in each case.

We have been enabled to make direct comparisons with most of the above species through the loan of a nice series of North American trouts by the U. S. National Museum, received through the courtesy of Professor Barton A. Bean.



FIG. 4. View of White Pine Lake from Tower Hill.

DISTRIBUTION.

The specimens we have studied were collected August 7th to 9th, 1924, in "White Pine Lake," so called by the natives, located in latitude $47^{\circ} 24'$ N. and in longitude $80^{\circ} 15'$ W., in Gamble Township, Timagami Forest Reserve, Province of Ontario, Canada. This lake has an altitude of approximately 1300 feet above sea-level, and is unnamed on the Gowganda Sheet (8NE) of the Standard Topographical Map issued by the Department of the Interior of Canada (1921). It is directly east of Smoothwater Lake, and on the map

(Pl. IX) is shown as the long, narrow lake running from southeast to northwest and draining into Smoothwater Lake. These lakes form the headwaters of the East Branch of the Montreal River, an affluent of the St. Lawrence system.

Although our specimens of this trout are all from White Pine Lake, we saw small specimens of what were undoubtedly *S. timagamiensis* in Clearwater Lake and know that specimens were caught in the small lake to the southwest of White Pine Lake. We were informed by Mr. Dick, of Gowganda, that this species occurs in the small pond formed by the creek running from Clearwater to Smoothwater Lake. Forest-rangers report its occurrence in Smith Lake, which is west of Smoothwater Lake. These bodies of water are all small lakes draining into Smoothwater Lake. Therefore this species may occur also in Apex, Parent, Lulu, Okiniada, Lady Dufferin, and Kennedy Lakes; thus constituting a total area of probable distribution of about eighty square miles. It is not known to occur in Smoothwater Lake.

White Pine Lake (Fig. 4) is a body of clear water approximately three miles long and one-sixth of a mile wide. The region surrounding it is an uninhabited wilderness of forest, consisting of pine, spruce, balsam, cedar, silver birch, and poplar, growing upon the almost bare Huronian diabase, which is the general rock-formation of this region. The lake-bottom is practically free of sediment, the stones being imbedded in a coarse sand and scantily covered with a growth of algæ. There is but little growth of water-weeds, and the white and yellow pond-lilies, common in this region, are conspicuously absent. From these waters we have also taken specimens of *S. fontinalis* and of a sucker (*Catostomus catostomus*). We have been informed that *S. namaycush* has been taken in Smoothwater Lake, where we have taken a few wall-eyed pike (*Stizostedion*).

All of the smaller specimens of the Aurora Trout taken by us were infested by a parasitic copepod, identified by Professor Charles Branch Wilson as *Salmincola edwardsii* (Olssen). These parasites were abundantly attached to all fins, especially to the dorsal. The caudal fins of the larger specimens, which, when taken, were free from this parasite, nevertheless showed scars or markings, proving earlier infestation.

SIZE.

Our specimens, as previously indicated, range in size from 8.63 to 16 inches in total length. In addition, we have caught and seen specimens of 18 inches or even greater length. From this it is evident that *S. timagamiensis* approximates *S. fontinalis* rather than *S. namaycush* in range of size.

HISTORICAL.

On September 1, 1923 a party of anglers consisting of the junior author, Messrs. Arno C. Fieldner, Wm. P. Yant, and S. H. Katz, caught four specimens of the species herein described in White Pine Lake, one or two specimens of *S. fontinalis* being taken at the same time. On the following day, two more specimens of the Aurora Trout were taken in the small lake to the southwest of White Pine Lake. All of these specimens were not less than twelve inches or more than eighteen inches in total length. Not recognizing the species, but assuming that it was what was commonly and vaguely referred to as "Gray Trout" and "Salmon Trout," no attempt was made to preserve specimens, the salted skin of only one being brought out as a trophy.

A search of the literature by the junior author failing to positively identify the fish, the senior author was consulted. Upon his advice, the matter was taken up with Dr. William C. Kendall of the U. S. Bureau of Fisheries. In commenting, Dr. Kendall wrote that he was unable to make an identification, but said: "For several reasons, I do not believe it to be a hybrid. It is quite possible that in those waters there is a hitherto unrecognized species." Acting upon this suggestion, on May 15, 1924, the junior author, accompanied by Mr. Charles O. Goulding, Jr., of Pittsburgh, made a trip to Timagami to collect for the Carnegie Museum specimens of this and other trouts native to the region. However, because of extremely cold weather and consequent poor angling, it was found impossible to carry out the plans made.

On July 31, 1924, the authors left with the same purpose in view. After travelling to Latchford, Ontario, it was necessary for five days to proceed by canoe and trail until White Pine Lake was reached. We there remained in camp for four days, taking the specimens

listed on August 7, 8, and 9. These were preserved in four percent formaldehyde. Natural color photographs of several of the specimens, as well as of specimens of *S. fontinalis* from the Lady Evelyn River were taken. While encamped at this spot, we met Messrs. Marrit and Bruno, government rangers, stationed on Smoothwater Lake. They gave us general information concerning the distribution of *S. timagamiensis*. Mr. Dick of Gowganda visited Smoothwater and White Pine Lakes during our presence and gave us information concerning methods by which other anglers had taken numbers of this fish. These people, of course, were unaware that this was a distinct species, referring to them as "Rainbow Trout."

HABITS.

In the short space of time at our disposal, it was not possible to make more than the most casual observations in regard to the habits of *S. timagamiensis*. In general it appears that these are similar to those of *S. fontinalis*, with which they share their habitat. This would apply to their food, times of feeding, etc. We are informed that in the early spring they may be taken on the surface by means of flies. We have caught them in August and September by still-fishing with worms at a depth of about fifteen feet and by trolling with small or medium-sized spoons and fly-spoons at depths of about forty feet. In the stomach of one Aurora Trout caught on a troll was found a recently swallowed Wood-mouse.

REPRODUCTION.

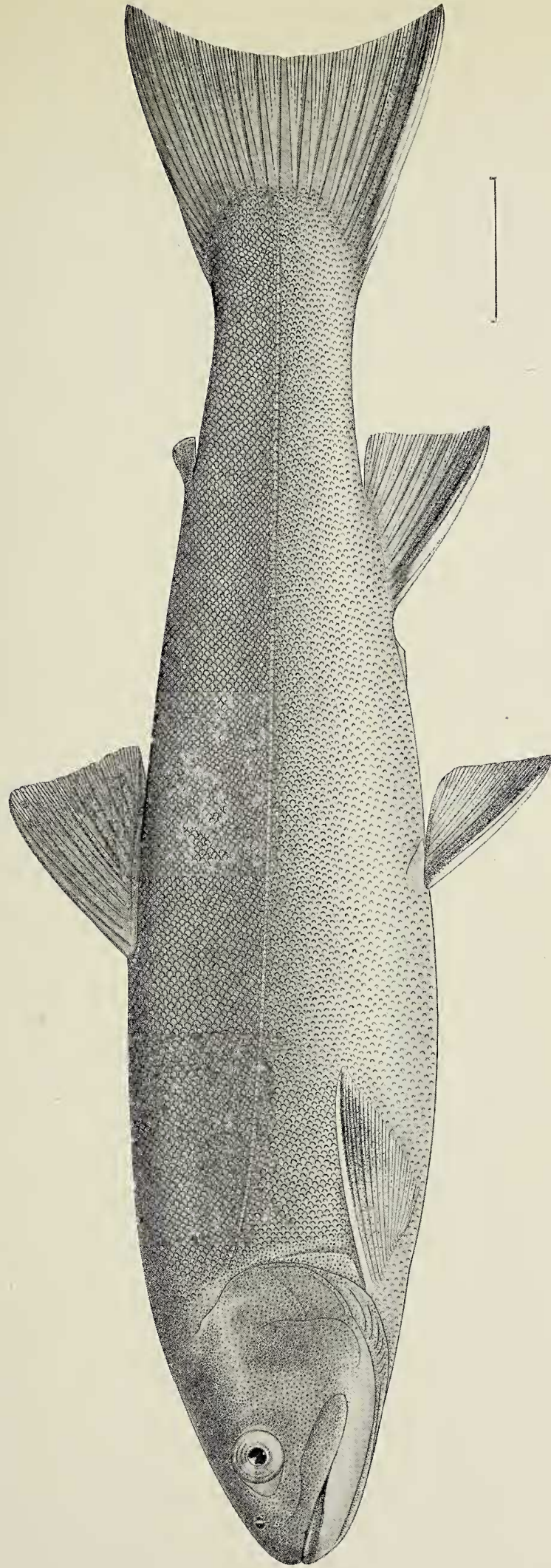
No observations have been made regarding their breeding habits. It was noted that in September the fish taken appeared much brighter than those taken in August and that faint crimson spots similar to those in *S. fontinalis* appeared to show through the characteristically silvery sides. From this it would seem that the late fall is their spawning period. The creeks are few, shallow, and short. It is to be presumed that these or the shallows of the lakes form their spawning beds.

PROTECTION.

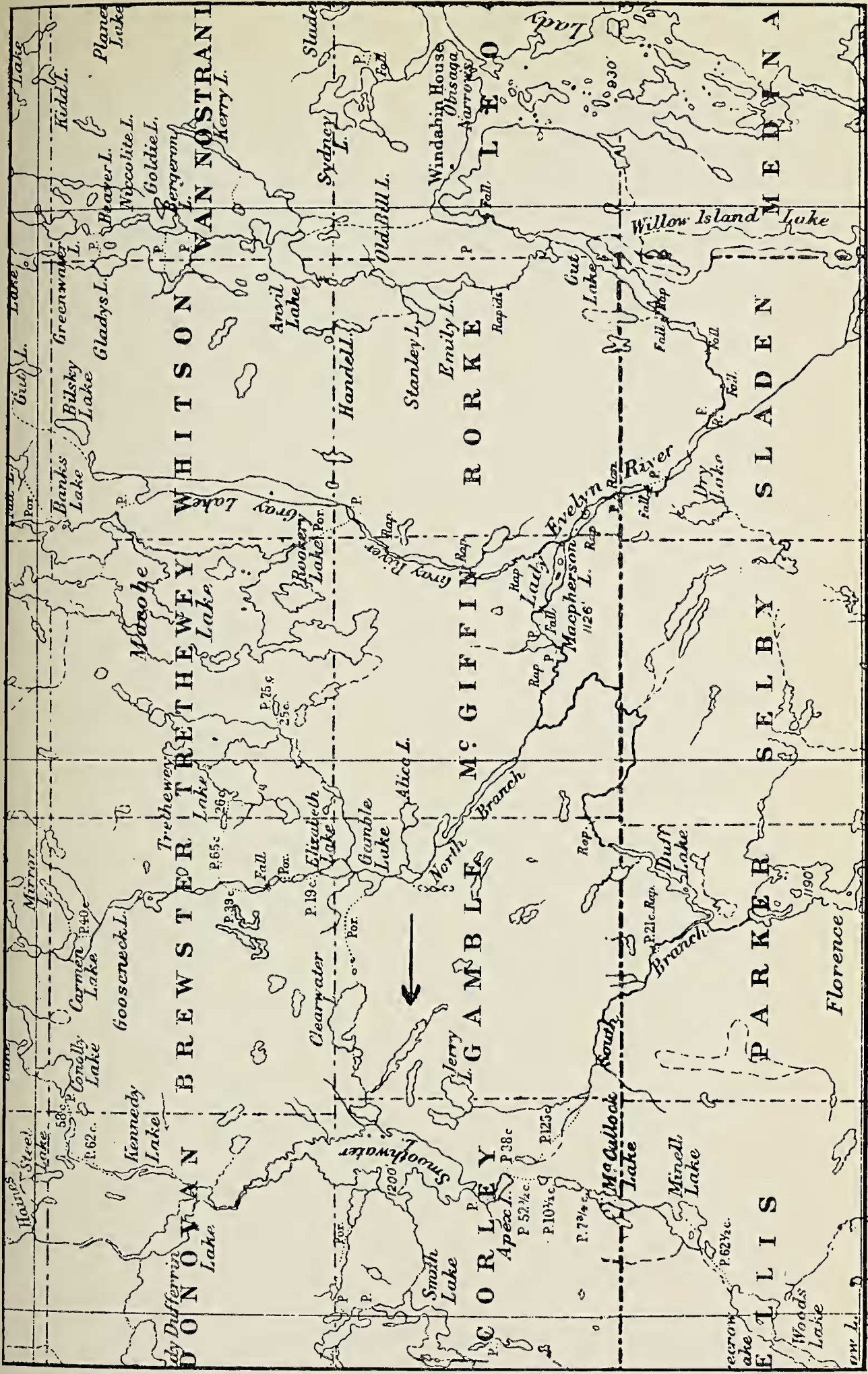
At present this species is but casually protected under very liberal laws applying to *S. fontinalis*, under which an open season, extending from May 1st to September 30th, permits each angler to take ten pounds per diem. In view of the rapid rate at which other rare trouts of restricted distribution have been rendered almost extinct, it is to be hoped that measures will be taken by either the Provincial or Dominion Government toward the conservation of this new species. Perhaps the best safeguard against its extinction lies in the long and difficult journey between the railroad and its habitat.

DATA.

On the appended sheet are given the data obtained in the course of study of the specimens listed, following the method used by Dr. William C. Kendall in his paper, "The Fishes of New England. The Salmon Family, Part I.—The Trout or Charrs," *Memoirs of the Boston Society of Natural History*, Vol. VIII, No. I, pp. 1-103, 7 plates.



Salvelinus imagamiensis Henn and Rinkenbach.



Map of part of the Timagami Region, the arrow pointing to White Pine Lake, which bears no name on the map issued by the Canadian Government, a part of which map is reproduced on this plate.